

## Section 6.6 Transformations

$$f(x) = a \sin(x-c)+d$$

$a \rightarrow$  vertical stretch/compression

$a > 1$  vertical stretch

$0 < |a| < 1$  vertical compression

$a < 0$  -reflection

$c \Rightarrow$  horizontal translation (phase shift)

$d \Rightarrow$  vertical translation

Both  $a$  &  $d$  effect the range  
(max/min and equation of the axis of symmetry)

$$\text{range } R = \{y \in \mathbb{R} \mid \min \leq y \leq \max\}$$

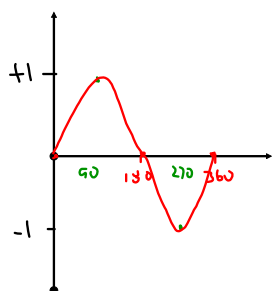
Eqn of the axis  $y=d$

$$\begin{aligned} \max &= d+a \\ \min &= d-a \end{aligned} \quad \left. \vphantom{\begin{aligned} \max &= d+a \\ \min &= d-a \end{aligned}} \right\} \begin{array}{l} \text{if axis greater} \\ \text{than zero} \end{array}$$

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Base Function  $f(x) = \sin x$



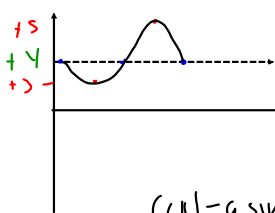
0	0
90	+1
180	0
270	-1
360	0

$$f(x) = a \sin(x-c) + d$$

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i) The function  $f(x) = \sin x$  is reflected across the  $x$  axis and translated up 4 units. State the new equation.

$$y = -\sin x + 4$$



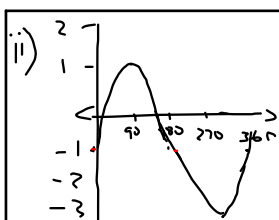
$$f(x) = a \sin(x-c) + d$$

$$d = +4 \quad f(x) = -\sin x + 4$$

$$a = -1$$

0	4
90	3
180	4
270	3
360	4

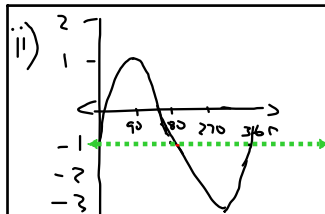
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$$y = a \sin(x-c) + d$$

$$d = \frac{\max + \min}{2}$$

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$$y = a \sin(x-c) + d$$

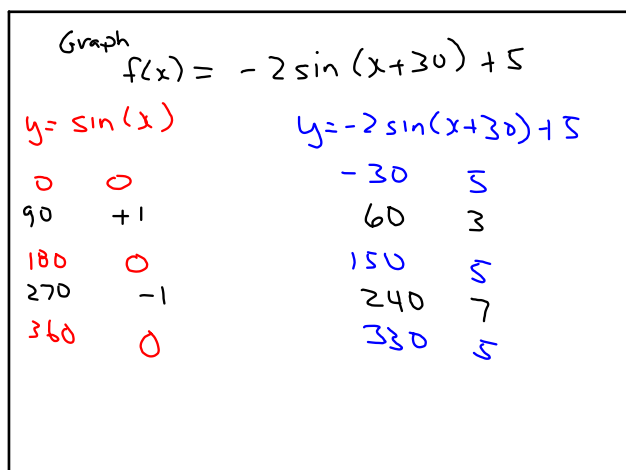
$$d = \frac{\max + \min}{2}$$

$$= \frac{1 + -3}{2}$$

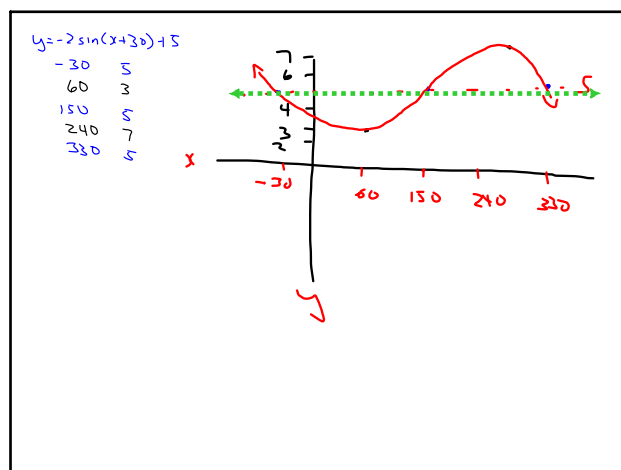
$$= -1$$

$$y = 2 \sin x - 1$$

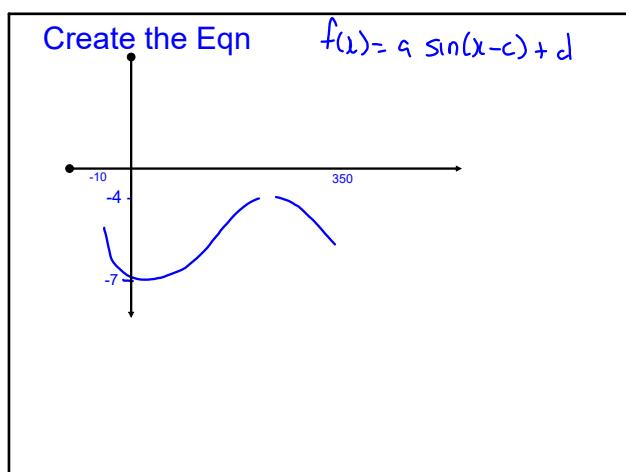
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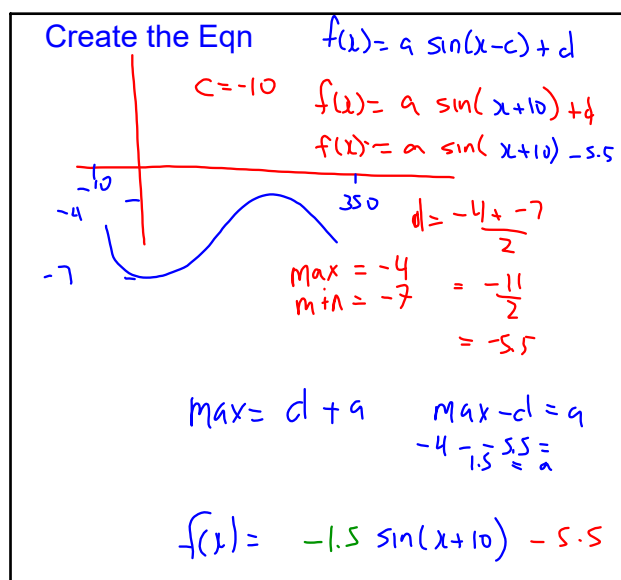
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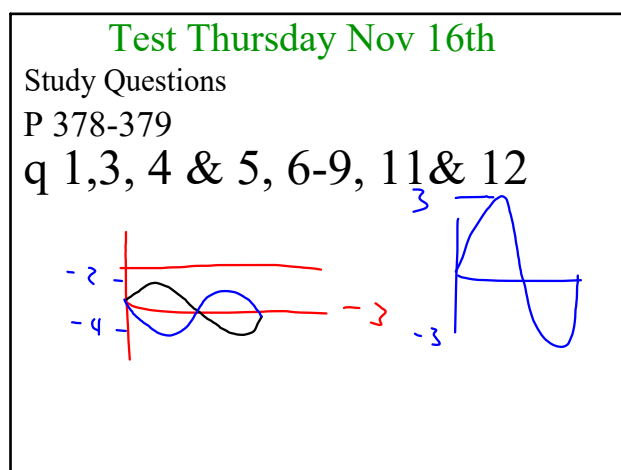
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